

BAB VI

PERHITUNGAN BALOK B4

6.1 Properties Balok B4

Data - data : $b := 300 \text{ mm}$ Tulangan utama D22 mm
 $h := 600 \text{ mm}$
 $d := h - (40 + 10 + 0.5 \cdot 22) = 539 \text{ mm}$
 $d_{aksen} := h - d = 61 \text{ mm}$
 $f_c := 20.75 \text{ Mpa}$ $\beta := 0.85$
 $f_y := 390 \text{ Mpa}$

$$\rho_b := 0.85 \cdot \beta \cdot \frac{f_c}{f_y} \cdot \left(\frac{600}{600 + f_y} \right) = 0.02$$

$$\rho_{max} := 0.75 \rho_b = 0.017$$

$$\rho_{min} := \frac{1.4}{f_y} = 0.0036$$

$$m := \frac{f_y}{0.85 \cdot f_c} = 22.11$$

Dari output ETABS didapat :

Mutump := 291.5402 kNm

Mulap := 234.6430 kNm

6.2 Perhitungan Tulangan Lentur Tumpuan

ambil $\delta := 0.4$

$$M_n := \frac{Mutump \cdot 10^6}{0.8} = 364425250 \text{ Nmm}$$

$$R_n := \frac{(1 - \delta) M_n}{b \cdot d^2} = 2.509 \text{ N/mm}^2$$

$$(\rho - \rho_{aksen}) := \frac{\left(1 - \sqrt{1 - \frac{2m \cdot R_n}{f_y}} \right)}{m} = 0.007$$

$$\rho_{aksen} := \frac{\delta \cdot M_n}{f_y \cdot (d - d_{aksen}) \cdot b \cdot d} = 0.0048$$

$$\rho := 0.007 + 0.0048 = 0.0118 > \rho_{min} = 0.0036$$

$$A_{sperlu} := \rho \cdot b \cdot d = 1908.06 \text{ mm}^2$$

$$A_s := 0.785 \cdot 22^2 \cdot 7 = 2659.58 \text{ mm}^2$$

$$s1 := \frac{(300 - 70 - 20 - 5 \cdot 22)}{5 - 1} = 25 \text{ mm} \quad \blacksquare > \blacksquare \quad 25 \text{ mm} \quad \text{OK!!}$$

$$A_{s_{\text{aksenperlu}}} := \rho_{\text{aksen}} \cdot b \cdot d = 781.94 \text{ mm}^2$$

$$A_{st} := 0.785 \cdot 22^2 \cdot 5 = 1899.7 \text{ mm}^2$$

pasang tul tarik 7D22 dan tulangan tekan 5D22

6.3 Perhitungan Tulangan Lentur Lapangan

$$\text{ambil } \delta := 0.4$$

$$M_n := \frac{M_{\text{lap}} \cdot 10^6}{0.8} = 293303750 \text{ Nmm}$$

$$R_n := \frac{(1 - \delta) M_n}{b \cdot d^2} = 2.02 \text{ N/mm}^2$$

$$(\rho - \rho_{\text{aksen}}) := \frac{\left(1 - \sqrt{1 - \frac{2m \cdot R_n}{f_y}}\right)}{m} = 0.0055$$

$$\rho_{\text{aksen}} := \frac{\delta \cdot M_n}{f_y \cdot (d - d_{\text{aksen}}) \cdot b \cdot d} = 0.0039$$

$$\rho := 0.0055 + 0.0039 = 0.0094 \quad \blacksquare > \blacksquare \quad \rho_{\text{min}} = 0.0036$$

$$A_{s_{\text{perlu}}} := \rho \cdot b \cdot d = 1519.98 \text{ mm}^2$$

$$A_s := 0.785 \cdot 22^2 \cdot 7 = 2659.58 \text{ mm}^2$$

$$s1 := \frac{(300 - 70 - 20 - 5 \cdot 22)}{5 - 1} = 25 \text{ mm} \quad \blacksquare > \blacksquare \quad 25 \text{ mm} \quad \text{OK!!}$$

$$A_{s_{\text{aksenperlu}}} := \rho_{\text{aksen}} \cdot b \cdot d = 629.34 \text{ mm}^2$$

$$A_{st} := 0.785 \cdot 22^2 \cdot 5 = 1899.7 \text{ mm}^2$$

pasang tul tarik 7D22 dan tulangan tekan 5D22

6.4 Perhitungan Tulangan Geser Balok

$$V_c := \frac{\sqrt{f_c} \cdot b \cdot d}{6} = 122763.09 \text{ N}$$

$$V_u := 168116 \text{ N}$$

$$V_c = 122763.09 \text{ N}$$

$$V_s := \frac{V_u}{0.75} - V_c = 101391.57 \text{ N} \quad \text{Perlu tulangan geser !!}$$

$$\text{Bila dipasang tulangan } \Phi 10 \text{ sebagai sengkang, } A_v := 2 \cdot 0.785 \cdot 10^2 = 157 \text{ mm}^2$$

$$f_y := 240 \text{ Mpa}$$

$$s_v := \frac{A_v \cdot f_y \cdot d}{V_s} = 200.31 \text{ mm}$$

sehingga dipakai tulangan geser tumpuan $\phi 10 - 100$ dan lapangan $\phi 10 - 150$